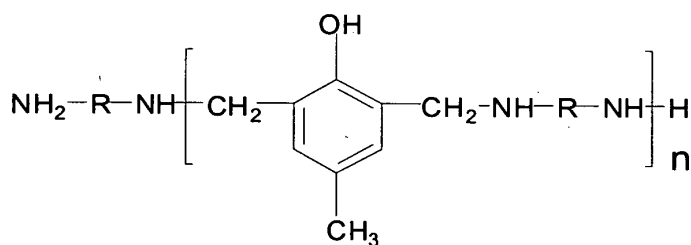


## WHAT IS CLAIMED IS:

1. A method for producing random form of nanosilica plates, comprising the steps of:

(a) preparing amine-terminating Mannich oligomers (AMO) from polyoxyalkylene amine, p-cresol and formaldehyde to obtain a polymeric exfoliating agent having a general formula:

### AMO



where  $n=1$  to  $5$

wherein  $n$  is from 1 to 5;  $R$  represents an organic group selected from the group consisting of polyoxypropylene groups, polyoxyethylene/oxypropylene groups, and polyethylene amino groups; wherein said formaldehyde is added at an appropriate addition rate by which the exothermic temperature is kept below  $120^\circ\text{C}$ ;

(b) adding inorganic acid to acidify said AMO ;

(c) mixing said acidified AMO with a swelled inorganic layered silicate clay so as to exfoliate said silicate clay directly through cationic exchange;

(d) adding an aqueous solution containing a hydroxide or a chloride of alkali metal or alkaline-earth metal, ethanol, water and an organic solvent to said exfoliated silicate clay obtained in step (c), and then keeping the mixture static to form an upper organic phase and a lower water phase containing nanosilica plates.

2. The method as claimed in claim 1, wherein said polyoxyalkylene amine used in said step (a) has molecular weight ranging from 400 to 4,000 g/mol.

3. The method as claimed in claim 1, wherein said polyoxyalkylene amine used in said step (a) has molecular weight ranging from 1,000 to 2,000 g/mol.

4. The method as claimed in claim 1, wherein said polyoxyalkylene amine used in said step (a) is selected from the group consisting of polyoxypropylene diamine, polyoxyethylene diamine, polyoxybutylene diamine and poly(oxyethylene-oxypropylene)diamine polyetheramines.

5. The method as claimed in claim 1, wherein said polyoxyalkylene amine used in said step (a) is polyoxypropylene diamine.

6. The method as claimed in claim 1, wherein said polyoxyalkylene diamine, p-cresol and formaldehyde in said step (a) are added at a molar ratio  $(n+1):n:2n$ , wherein  $n$  is 1 to 5.

7. The method as claimed in claim 1, wherein said formaldehyde used in said step (a) is added at a reaction temperature in the range of 25°C to 160°C.

8. The method as claimed in claim 1, wherein 25~100 wt% of said exfoliating agent obtained in said step (a) has molecular weight ranging from 9,000 to 20,000.

9. The method as claimed in claim 1, wherein said exfoliating agent and said inorganic acid are mixed in an equivalent ratio 2:1 in said step (b).

10. The method as claimed in claim 1, wherein said inorganic acid used in said step (b) is selected from the group consisting of hydrochloric acid, sulfuric acid, phosphoric acid and nitric acid.

11. The method as claimed in claim 1, wherein the molar ratio of amino groups in said exfoliating agent to cationic exchange capacity of said silicate clay ranges from 3:1 to 1:1 in said step (c).

12. The method as claimed in claim 1, wherein said silicate clay used in said step (c) is selected from the group consisting of montmorillonite, kaolin, mica and talc.

13. The method as claimed in claim 1, wherein said silicate clay used in

said step (c) has a cationic exchange capacity ranging from 50 meq/100g to 200 meq/100g.

14. The method as claimed in claim 1, wherein said hydroxide or chloride of alkali metal or alkaline-earth metal used in said step (d) is sodium hydroxide.

15. The method as claimed in claim 1, wherein said hydroxide or chloride of alkali metal or alkaline-earth metal is added at the same equivalence in said step (d).

16. The method as claimed in claim 1, wherein said organic solvent used in said step (d) is selected from the group consisting of ether, ketone, ester, nitrile, saturated hydrocarbon, chlorinated saturated hydrocarbon and aromatic hydrocarbon.

17. The method as claimed in claim 1, wherein said organic solvent used in said step (d) is selected from the group consisting of tetrahydrofuran, isopropyl ether, methyl tert-butyl ether, methyl isobutyl ketone, ethylnitrile, ethyl acetate, pentane, hexane, heptane, cyclohexane, dichloromethane, benzene, toluene, dimethylbenzene, chlorobenzene and methoxybenzene.

18. The method as claimed in claim 1, wherein said hydroxide or chloride of alkali metal or alkaline-earth metal is added at 1 to 5 equivalences in step (d).

19. The method as claimed in claim 1, wherein said organic phase formed in said step (d) comprises said exfoliating agent suitable for recycling.

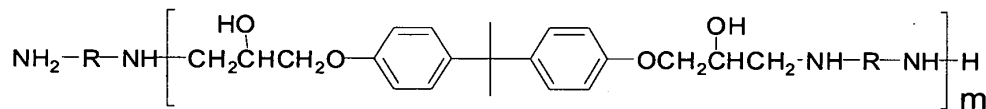
20. A nanosilica plate, which is obtained in water suspension with solid content from 0.1 to 90 weight percent in said step (d) of the method as claimed in claim 1.

21. A method for producing random form of nanosilica plates, comprising the steps of:

(a) preparing amine-terminating epoxy oligomers (AEO) from polyoxyalkylene amine and diglycidyl ether of bisphenol-A at a molar ratio of

(m+1) : m, where m=1 to 5, and at a reaction temperature between 25 °C and 150°C, to obtain a polymeric amine exfoliating agent, having a general formula:

**AEO**



where m=1 to 5

wherein m is from 1 to 5; R is an organic group selected from the group consisting of polyoxypropylene groups, polyoxyethylene/oxypropylene groups, and polyethylene amino groups;

(b) adding inorganic acid including hydrochloric acid to acidify said AEO ;

(c) mixing said acidified AEO with a swelled inorganic layered silicate clay so as to exfoliate said silicate clay directly through cationic exchange;

(d) adding an aqueous solution containing a hydroxide or a chloride of alkali metal or alkaline-earth metal, ethanol, water and an organic solvent to said exfoliated silicate clay obtained in step (c), and then keeping the mixture static to form an upper organic phase and a lower water phase containing nanosilica plates.

22. The method as claimed in claim 21, wherein said polyoxyalkylene amine used in said step (a) has molecular weight ranging from 400 to 4,000 g/mol.

23. The method as claimed in claim 21, wherein said polyoxyalkylene amine used in said step (a) is selected from the group consisting of polyoxypropylene diamine, polyoxyethylene diamine, polyoxybutylene diamine and poly(oxyethylene- oxypropylene)diamine polyetheramines.

24. The method as claimed in claim 21, wherein 25-100 wt% of said exfoliating agent in said step (a) has molecular weight ranging from 2,000 to 20,000.

25. The method as claimed in claim 21, wherein said exfoliating agent and said inorganic acid are mixed in an equivalent ratio 2:1 in said step (b).

26. The method as claimed in claim 21, wherein the molar ratio of amino groups in said exfoliating agent to cationic exchange capacity of said silicate clay ranging from 3:1 to 1:1 in said step (c).

27. The method as claimed in claim 21, wherein said silicate clay used in said step (c) is selected from the group consisting of montmorillonite, kaolin, and mica.